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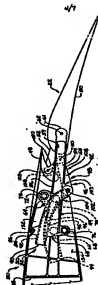
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Trailing edge flaps.

An aircraft wing with a trailing edge flap and a flap-supporting system toward each end of the flap. The flap-supporting systems are completely housed within the wing of the aircraft when the flap is in its stowed or retracted position. Each of the flap-supporting systems includes a first track (54) to which the flap is attached. That track is displaceable in a chordwise direction between extended and retracted positions. Also included in each flap-supporting system is a second, immobile program track (44) and a crank-and-follower (96) system which cooperates with that track to change the angle of the flap as the flap is extended. Lead screw type drives are employed to extend and retract the flap, and cans are used to keep fuel from leaking out of the wing through openings provided in the latter's rear spar to accommodate the first-mentioned tracks of the flap-supporting mechanisms.



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TRAILING EDGE FLAPS

TECHNICAL FIELD OF THE INVENTION

The present invention relates to trailing edge
5 flaps for aircraft and, more particularly, to novel,
improved trailing edge flaps with flap-supporting
systems that can be housed entirely within a wing of
uninterrupted contour to reduce drag on the aircraft.

10 BACKGROUND OF THE INVENTION

Typically, the supporting and operating
mechanisms for a trailing edge flap are housed in large
external fairings on the under side of the wing in which
the flap is incorporated. These fairings create drag
15 which it is advantageous to eliminate because of its
considerable magnitude.

An exemplary arrangement of the character just
described is disclosed in U.S. patent No. 3,698,664
issued October 17, 1972, to Bonney for AIRCRAFT.

20

SUMMARY OF THE INVENTION

I have now invented novel trailing edge flaps
which differ from those just discussed in that their
flap-supporting and operating systems are housed
25 entirely within the wing in which the flap is
incorporated. This eliminates the bulky external
fairings heretofore employed to house those systems and
the drag which those systems create.

Toward the inboard and outboard ends of the
30 flap I employ flap-supporting systems which include a
main support track and a program track. The flap is
attached to the main support track which is translatable
(or displaceable) chordwise of the wing and guides the

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flap as the latter is extended and retracted. A crank-and-follower system in which the follower rides along the program track is employed to change the angle of the flap as it is extended.

- 5 To minimize the gap between the rear spar of the wing and the leading edge of the flap, the main support tracks are so designed that they penetrate, or extend forwardly through, the rear spar when the flap is in its retracted or stowed position. Track cans fixed
10 to the structural framework of the wing keep fuel from leaking through the openings provided in the rear spar to thus accommodate the main support tracks.

- The main support and program tracks are integrated into one unit with one crank arm of the flap
15 angle programming mechanism sandwiched therebetween. One advantage of this novel arrangement is the elimination of wing flexure-induced changes in the angle of the flap. Another is that the side-by-side arrangement of the main support track and the program
20 track leave spaces above and below the flap-supporting mechanisms through which hydraulic and electrical systems can be led, eliminating undesirable circuitous routing of those systems.

- Also, the integrated track arrangement
25 improves the load distribution in the main, flap-supporting tracks and in the components by which those tracks are supported from the structural framework of the aircraft wing. The integrated track system accomplishes this by effectively shortening the
30 balancing load paths in the main support tracks.

 Yet another advantage of the novel flap-supporting system I employ is that the need for flap supports at the extremities of the flap is

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eliminated. The consequence is that the number of flap-supporting mechanisms can be reduced, typically from four to three.

It is also significant that program tracks are required only at the endmost two of the support stations. In the center of the flap only the main support track is needed so the flap-supporting arrangement can be advantageously simpler there.

Furthermore, the novel flap-supporting systems I have invented are compatible with the requirements of the sophisticated, high lift, double-slotted flaps of the vane/main type required by state-of-the-art wing designs which involve smaller areas and higher aspect ratios. And my novel flap-supporting arrangement helps to avoid weight flutter penalties by increasing the available wing chord box.

Rotating ball screws are utilized to extend and retract the flaps. These drives are connected through torque shafts to a centralized drive shaft.

THE PRIOR ART

A number of previously issued patents disclose trailing edge flap and comparable systems which superficially resemble the novel trailing edge flaps disclosed herein to a limited extent.

Specifically, U.S. patents Nos. 1,540,505 issued June 2, 1925, to Cook, Jr. for AIRPLANE; 2,202,430 issued May 28, 1940, to Rebeski for MEANS FOR SHIFTING FLAPS ON AIRCRAFT; 2,502,315 issued March 28, 1950, to Earhart for OPERATING MECHANISM FOR HIGH LIFT DEVICES FOR AIRPLANES; 2,526,929 issued October 24, 1950, to Bowcott for AIRPLANE FLAP EXTENSION; 2,661,166 issued December 1, 1953, to Gordon for AIRCRAFT FLAP

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MECHANISM; 2,836,380 issued May 27, 1958, to Pearson for AIRPLANE WING WITH SLOTTED FLAP; 3,438,598 issued April 15, 1969, to Tammel for EXTENDABLE WING FLAP FOR AIRPLANES; 3,568,957 issued May 9, 1971, to Wood for
5 LONG STRUCTURAL COLUMN SUPPORT; and 3,778,009 issued December 11, 1973, to Jones for AERODYNAMIC SURFACES all disclose trailing edge flaps (or flaplike components) with a flap-supporting arrangement that includes a track for supporting and guiding the track, this track being
10 housed in the aircraft wing in which the flap is incorporated. In none of these prior art systems, however, is the main support track extendable to translate (or extend and retract) the flap; and program tracks for changing the angle of the flap as it is
15 extended and retracted are lacking. As a consequence, the prior art systems do not have those above-discussed capabilities or advantages of my novel trailing edge flaps.

Chilton patent No. 2,222,935 issued
20 November 26, 1940, for VARIABLE AREA-AND-CAMBER WING is concerned with a system for extending and retracting a rear auxiliary wing. This patented arrangement includes a displaceable, internally housed, track type support for the auxiliary wing. Again, however, there is no
25 program track for changing the angle of the auxiliary wing as it is extended; and the Chilton arrangement consequently does not have the capabilities and advantages of my novel trailing edge flaps.

U.S. patents No. 2,426,785 issued September 2,
30 1947, to Naumann for VARIABLE AIRFOIL and the above-cited patent to Bonney do disclose systems in which one track is employed to support and guide a trailing edge flap as the latter is extended and

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retracted and in which a second track programs a change in the angle of the flap as the latter is extended. Once again, however, the main support track is not displaceable; and, as a result, the patented system is not comparable to mine.

The above-cited Pearson, Tammel, and Wood patents are concerned with drive systems in which a rotating lead screw is utilized to extend and retract a trailing edge flap; and a system of that character is also employed in the Boeing 757 aircraft. However, the foregoing prior art systems do not contain a dual track arrangement for guiding and supporting the flap and for changing its angle; and they consequently do not take advantage of the benefits that can be obtained by combining a main support/program track system and the lead screw type of operating system.

OBJECTS OF THE INVENTION

From the foregoing it will be apparent to the reader that one important and primary object of my invention is the provision of aircraft wings with novel, improved trailing edge flaps.

Yet another important and primary object of the present invention is the provision of novel, improved, trailing edge flaps which generate significantly less drag than those commonly employed systems in which the flap-supporting and operating mechanisms are housed in external fairings.

A related, also important and primary object of the present invention is the provision of novel trailing edge flaps with flap-supporting and operating mechanisms so constructed that those mechanisms can be

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housed entirely within the aircraft wing in which the flap is incorporated;

Still other important and primary objects of the invention reside in the provision of novel trailing edge flaps:

- (1) which require fewer supports than conventional flap-supporting systems such as that used in the Boeing 757 aircraft, for example;
 - (2) which include flap-supporting and operating systems so housed in the aircraft's wing as to leave passages for hydraulic and electrical systems between the flap-associated systems and the skin of the aircraft wing, both above and below the flap-associated systems;
 - (3) which improve the distribution of the loads imposed on the load-bearing components of the flap-supporting systems;
 - (4) in which the load-bearing components of the flap-supporting systems extend forwardly through the rear spar of the aircraft wing and in which cans are employed to keep fuel from leaking through those openings in the spars that accommodate the load bearing components;
 - (5) which utilize a motor driven lead screw system to extend and retract the flaps.
- Other important objects and features and additional advantages of my invention will be apparent from the foregoing and the appended claims and from the accompanying drawing taken in conjunction with the ensuing detailed description and discussion of the invention.

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BRIEF DESCRIPTION OF THE DRAWING:

In the drawing:

Figure 1 is a partial, and schematic, plan
5 view of an aircraft wing with inboard and outboard flaps
that are supported, and translated between stowed and
extended positions, in accord with the principles of the
present invention;

FIG. 2 is a partial plan view of the wing
10 showing, in more detail, one of the systems employed to
support the outboard flap and to translate that flap
between its stowed and extended positions;

FIG. 3 is a third, partial plan view of the
wing showing, in still more detail, one of the
15 flap-supporting mechanisms;

FIG. 4 is a vertical, chordwise section so
taken through the wing and the outboard flap as to show
one of two like flap-supporting systems as that system
appears with the outboard flap in its stowed (or
20 retracted) position;

FIGS. 5 and 6 are views similar to FIG. 4, but
show the outboard flap in, respectively, a partly
extended position and a fully extended position;

FIG. 7 is a view similar to FIG. 4 but
25 simplified and showing a can employed to keep fuel from
leaking out of the wing past a main track component of
the flap-supporting system; and

FIG. 8 is a vertical section through the wing
taken to show details of one of two like drive systems
30 employed to translate the outboard flap between its
stowed and extended positions.

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DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawing, FIG. 1 schematically depicts a high aspect ratio aircraft wing 20 of relatively small area. Incorporated in that wing are outboard and inboard trailing edge flaps 22 and 24, each constructed in accord with, and embodying, the principles of the present invention.

Wing 20 is of conventional construction to the extent that it is an airfoil and has a structural framework, including front and rear spars 26 and 28, and a skin 30 covering the structural framework. The details of wing 20 and its components are not part of the present invention; and they will, accordingly, be described herein only as necessary to an understanding of that invention.

Referring still to FIG. 1, the outboard, trailing edge flap 22 of wing 20 is supported from the structural framework of the wing by two support systems 32 and 34 located toward the outboard and inboard ends of the flap and by a third, centrally located flap-supporting system 36.

These three support systems, 32, 34, and 36, are completely housable within wing 20. They are designed to: (1) locate flap 22 in a housed (or retracted) position in which the flap uninterruptedly continues the airfoil configuration of wing 20, and (2) to guide and support the flap and to change its angle as the flap is translated or extended chordwise of wing 20 from the housed position to a partially extended position such as those shown in FIG. 5 or to the fully extended position shown in FIG. 6.

Their novel construction allows the two outermost flap-supporting systems 32 and 34 to be

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located inwardly from the extremities of flap 22 where the ball screw drives 38 and 40 are located. This is advantageous because it allows the number of flap-supporting systems, and therefore the complexity of the flap, to be reduced.

The ball screw type drive systems 38 and 40 near its extremities are employed to extend and retract flap 22.

Referring now to FIGS. 2-6, each of the flap-supporting systems 32 and 34 located inward of the ends of flap 22 includes: a main support track 42 for supporting and guiding flap 22 as it is extended and retracted and a second program track 44 which cooperates with a crank-and-follower assembly 46 (best shown in FIG. 6) to change the angle of flap 22 as the latter is extended.

Referring to FIG. 7, the third, centrally located flap-supporting system 36 has a displaceable or translatable main support track like that in the support systems 32 and 34 toward the ends of flap 22. It is unnecessary to employ a program track at that central location, which considerably simplifies the overall flap system.

Flap 22 is of the vane/main, double-slotted type. As shown in FIGS. 4-6, it includes a vane 48 supported by, and spaced forwardly from, a main flap 50 by brackets 52. Both the vane and main flap have airfoil sections, and the vane is so oriented with respect to flap 50 that the vane/main flap combination also has an airfoil shape. In the retracted (or stowed) position of flap 22, vane 48 and its supporting brackets 52 are housed entirely within wing 20 as is shown in FIG. 4.

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The details of the flap are not part of my present invention, and that component of wing 20 will accordingly not be described further herein except as is necessary to an understanding of that invention.

5 Referring still to FIGS. 2-6, the main support track 42 in each of the two flap-supporting systems 32 and 34 is an elongated member which has a vertically oriented web 54 and laterally extending flanges 56 and 58 which are integral with the web. These flanges
10 cooperate to form roller engageable guides 59 and 60 on opposite sides of web 54.

The aft end of track 42 terminates in an integral, bifurcated bracket 61. This bracket embraces a structural component in flap 50, which is pivotably
15 connected to bracket 61 by pivot member 62.

Each of the main support tracks 42 is supported from the structural framework of wing 20 for displacement in the chordwise direction by two sets of roller pairs, one on each side of the track. Each of
20 these two sets of roller pairs includes a forward roller pair 63 and a rear roller pair 64.

As is perhaps best shown in FIG. 6, the forward roller pair of the set disclosed in that figure includes roller 66 trapped in guide 59 and a cooperating
25 roller 68 which engages the lower, guide-defining flange 58 of track 42.

The more rearwardly roller pair 64 similarly includes a roller 70 trapped in guide 59 and a roller 72 which engages the upper flange 56 of track 42.

30 Thus, track 42 is embraced, and guided by, the two forwardmost rollers 66 and 68 and the more rearwardly located rollers 70 and 72 as it is translated (i.e., extended or retracted).

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Referring still to FIGS. 3-6, it will be apparent from the foregoing that there are two rollers 66, two rollers 68, two rollers 70, and two rollers 72. These four pair of rollers are mounted on separate
5 shafts or axles. Two of these are shown in the drawing. They are respectively identified by reference characters 76 and 78.

As is perhaps best shown in FIG. 3, the roller supporting axles are mounted in support ribs 80 and 82.
10 These ribs are located on the opposite sides of the main flap support track 42; and they are supported from the structural framework of wing 20.

Referring now specifically to FIG. 7, the forward end of main support track 42 extends forwardly
15 through the rear spar 28 of wing 20 when flap 22 is in its stowed, i.e., retracted, position. A can 83 fixed to the rear spar 28 of wing 20 surrounds the forwardly protruding end 84 of the retracted main support track 42 and covers the opening in that spar through which the
20 support track extends. As discussed above, this keeps fuel stored in the interior of wing 20 from leaking to the exterior of the wing.

Referring again to FIGS. 3-6, it will be remembered that each of the inboard and outboard
25 flap-supporting systems 32 and 34 also includes a program track 44 with which follower-and-crank assembly 46 cooperates to change (and more specifically, increase) the angle of trailing edge flap 22 as the latter is extended from the stowed position (FIG. 4) to a partially extended (FIG. 5) or fully extended (FIG. 6)
30 position.

Program track 44 is fixed against movement relative to wing 20. More particularly, it is fixed

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alongside main support track 42 to stationary support ribs 80 and 82 by the axles 76 and 78 on which rollers 68 and 72 are mounted and by a bolt 84 and nut 86 with a space 88 between the program and main support tracks as is best shown in FIG. 3.

Program track 44 has a vertically oriented base 90 as is shown in FIGS. 4-6, and there are laterally extending flanges 92 and 94 at the upper and lower edges of that portion. These flanges cooperate to form a guide or raceway 95 for a rotatable, roller type follower 96. That follower is incorporated in the follower-and-crank mechanism 46 employed in cooperation with program track 44 to change the angle of flap 22 as the latter is extended and retracted.

In addition to follower 96, the follower-and-crank mechanism includes a double-armed crank 98 and a motion transmitting link 100.

A pivot pin 102 supports crank 98 for rotation about a horizontal axis extending at right angles to the longitudinal axes of main support track 42 and program track 44. Pivot member 102 is journaled in a boss 103 which depends from the lower edge of main support track 42.

One arm 104 of crank 98 is located on the left-hand side of the main support track as shown in FIG. 4. That crank arm extends forwardly through the space between main support track 42 and program track 44. The second arm 108 of the crank extends rearwardly on the opposite side of the support track from crank extending arm 104, balancing the loads imposed upon support ribs 80 and 82 by the crank. Arms 104 and 108 are both rigidly fixed to pivot pin 102 which rotates in boss 103.

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As is perhaps most clearly shown in FIG. 6, motion transmitting link 100 is connected to the trailing end of rearwardly extending crank arm 108 by a pivot pin 110 and to the vane 48 of flap 22, forwardly of pivot pin 62, by a pivot pin 112.

As flap 22 is extended, main support track 42 is displaced rearwardly from the retracted or stowed position shown in FIG. 4 to either an intermediate position such as that shown in FIG. 5 or to the fully extended position shown in FIG. 6. As the main support track moves rearwardly, it carries crank 98 with it, causing follower 96 to roll rearwardly along the guide 95 formed by the flanges 92 and 94 at the edges of program track 44. This causes crank 98 to rotate in a counterclockwise direction about pivot member 102 at a rate which is initially modest and then increases as flap 22 approaches its fully extended position. This counterclockwise rotation of crank 98 effects a concomitant clockwise rotation of flap 22 about the pivot member 62 by which the flap is pivotably connected to main support track 42.

I pointed out above that flap 22 is extended and retracted by drive systems 38 and 40 of the ball screw type. The input to these is a central drive shaft 116 which is not part of my present invention and will accordingly not be described in detail herein.

Each of the two ball screw drives 38 and 40 includes a transmission 118 powered by shaft 116. The rotatable output 120 of transmission 118, which is again not part of the present invention, is a universal/ball joint which couples the transmission to an externally threaded lead screw 122.

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Assembled to the lead screw is an internally threaded follower 124. This follower is mechanically connected to flap 22 by upper and lower brackets 126 (only one of which is shown). The latter are attached to the flap and, at their free ends, are pivotally fixed to follower 124 by pivot pins 130 (one of which is shown in FIG. 2).

This method of connecting flap 22 to follower 124 keeps the latter from rotating with threaded lead shaft 122. Consequently, as the latter rotates, follower 124 moves rectilinearly along the lead screw. That displaces the flap rearwardly or forwardly in the chordwise direction, depending upon the direction of rotation of the lead screw. As it shifts, the flap follows a path determined by the configuration of the guide 59 and 60 defined by the upper and lower flanges 56 and 58 on main support track 42. Universal joint 120 accommodates the deflection of the lead screw which this entails as is shown in phantom lines in FIG. 8.

As discussed briefly above and shown in FIG. 7, the third, centrally located flap-supporting system 36 is like those just discussed except for the elimination of the program track and associated follower-and-crank mechanism. These components are not required at that location inasmuch as the inboard and outboard program tracks 44 provide the necessary control over the flap angle as well as the required structural redundancy.

As is shown in FIG. 4, for example, the just-described, integrated, side-by-side arrangement of main support track 42 and program track 44 leaves upper and lower spaces 132 and 134 between the support system and the skin 30 of wing 20. Electrical and hydraulic

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systems can be extended through these passages, eliminating the undesirable circuitous routing of those systems which would otherwise be required.

Referring again to FIG. 1, the inboard and
5 outboard support systems 136 and 138 for inboard flap 24 may be of the same construction as the above-described flap-supporting systems 32 and 34; and the ball screw drives 140 and 142 provided to extend and retract the inboard flap may be like the ball screw drives 38 and 40
10 used to extend and retract outboard flap 22 (because it is relatively short, inboard flap 24 does not require a third, central support as the outboard flap does). In view of the foregoing, the details of the inboard flap-supporting systems and the drive systems for
15 extending and retracting that flap will not be discussed in detail herein.

The principles of the present invention have been developed above primarily by reference to those applications of the invention in which a vane/main type,
20 double-slotted flap is employed. This approach is not intended to limit the scope of those principles which can equally well be employed in the construction of other trailing edge flap systems -- such as those of the single-slotted type -- by varying the configurations of
25 the main support and program tracks. Variations in aerodynamic requirements such as Fowler motion versus flap angle and slot gap width versus flap angle may be accommodated in a similar manner.

Thus, the invention may be embodied in other
30 specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the

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invention being indicated by the appended claims rather than by the foregoing description; and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

CLAIMS

What is claimed and desired to be secured by Letters Patent is:

- 5 1. The combination of: an aircraft wing; a trailing edge flap for increasing the lift generated by said wing and for providing air braking; and means entirely housable in said wing for extending said flap relative to said wing, said last-mentioned means
10 including a flap-supporting track which is extendable from said wing; a fixedly positioned, program track; and means including a follower displaceable along said program track for changing the angle of said flap as it is extended relative to said wing.
- 15 2. The combination defined in claim 1 wherein said flap is of the double-slotted type and includes: a main flap which is configured to complete the profile of said wing when the flap is retracted and an
20 airfoil-shaped vane and brackets so supporting said vane from the leading edge of said main flap that: (1) said vane is spaced forward of said main flap, and (2) said vane and said brackets are housed within said wing when said flap is in the retracted position.
- 25 3. The combination of: an aircraft wing; a trailing edge flap for increasing the lift generated by said wing and for providing air braking; and means toward each of the two ends of said flap for supporting
30 said flap from said wing, each said flap-supporting means including: a first track; means supporting said first track in said wing for movement between a retracted position in which said track is completely housed within said wing and positions in which said track is extended rearwardly from said wing; means so

fixing said flap to the aft end of said first track that said flap is extended to the rear of said wing from a retracted position in which the flap is adjacent and continues the contours of the wing as said first track is extended from said wing; a second track immovably housed entirely within said wing; and means including a follower which is displaceable along said second track as said first track and said flap are extended to change the angle of the flap.

10 4. The combination defined in claim 3 wherein said first and second tracks are disposed in side-by-side relationship and thereby free the spaces above and below said flap-supporting means for the housing of hydraulic and electrical systems and for
15 other purposes.

5. The combination defined in claim 3 which includes a third flap-supporting means intermediate the ends of said first and second flap-supporting means, said third flap-supporting means having only one track, and said track being a first track which is extendable rearwardly from said wing and has said flap fixed thereto as aforesaid.

6. The combination defined in claim 3 wherein said wing includes a structural framework and wherein
25 each of said flap-supporting means includes: at least two track-engaged elements supporting said first track for translation between its retracted and extended positions and means rotatably supporting said elements from the structural framework of said wing at locations
30 spaced chordwise of the wing.

7. The combination defined in claim 3 wherein the means fixing said flap to the aft end of said first track provides a pivotable connection therebetween and

wherein each flap-supporting means further includes: a crank extending in the same direction as said first track, means pivotably supporting said crank from said first track, means fixing said follower to the forward
5 end of said crank, and means so connecting the aft end of said crank to said flap that rotation of said crank about its pivot axis effects rotation of said flap about the pivot axis between the flap and said first track.

8. The combination defined in claim 7 wherein
10 the means connecting the aft end of the crank to the flap comprises a link, means pivotably fixing one end of said link to said aft end of the crank, and means fixing the other end of said link to said flap at a location spaced forwardly from the pivot axis between said flap
15 and said first track.

9. The combination defined in claim 7 wherein said wing includes a structural framework and each of said support means includes means supporting said second
20 track from said structural framework with one arm of said crank disposed between said first and second tracks.

10. The combination defined in claim 3 wherein said first track of each flap-supporting means has laterally extending flanges at the upper and lower edges
25 thereof and wherein the means for supporting said first track from the structural framework of the wing comprises first and second roller pairs spaced fore-and-aft of the wing, the rollers in one of said pairs respectively embracing the top and bottom of the
30 upper flange and the rollers in the other of said roller pairs respectively embracing the top and bottom of said lower flange.

11. The combination defined in claim 10 which includes a set of first and second roller pairs as aforesaid on each side of said first track.

12. The combination defined in claim 3
5 wherein said second track has laterally extending flanges at the upper and lower edges thereof and wherein said follower is trapped between and guided along said second track by said upper and lower flanges.

13. The combination defined in claim 12
10 wherein the means for connecting said first track to said flap comprises an integral bracket at the rear end of said first track and means pivotably fixing said bracket to said flap.

14. The combination of: an aircraft wing, a
15 trailing edge flap for increasing the lift generated by said wing and for providing air braking, a flap support, means pivotally fixing said flap to said support for rotation about an axis extending spanwise of the wing, guide means fixed relative to said wing with respect to
20 which said flap support can move to extend said flap relative to said wing, and means for changing the angle of said flap as it is extended relative to said wing which comprises: an actuator, first and second pivot means fixing said actuator to said flap, and means fixed
25 to said wing and along which said actuator is displaceable as said flap is extended relative to said wing for rotating said said actuator about said first pivot means to effect the aforesaid rotation of said flap.

15. The combination of: an aircraft wing
30 which is adapted to have fuel stored therein; a trailing edge flap for increasing the lift generated by said wing and for providing air braking; and means toward the two

ends of said flap for supporting said flap from said wing, said wing having a structural framework which includes a rear spar extending longitudinally along the trailing edge of the wing and each said flap supporting
5 means including a track which is extendable chordwise of said wing to a retracted position in which said track is housed entirely within the wing, said track having a leading end which extends forwardly through said spar when said flap is in its retracted position, and said
10 combination further comprising a housing which is supported from the structural framework of the wing and so surrounds said forward end of said track as to keep fuel stored in said wing from leaking around said track through said rear spar.

15 16. The combination of: an aircraft wing; a trailing edge flap for increasing the lift generated by said wing and for providing air braking; means toward each of the two ends of said flap for supporting said flap from said wing; and means at each end of said flap
20 for displacing said flap between a retracted position in which said flap is adjacent and continues the contours of said wing and positions in which said flap is extended to the rear of the wing, said flap-supporting means each including: a track; means in said wing
25 supporting said track for movement between a retracted position in which said track is completely housed within said wing and positions in which said track is extended rearwardly from said wing; and means fixing said flap to the aft end of said first track, whereby said flap is
30 extended to the rear of said wing from said retracted position to one of said extended positions as said first track is extended rearwardly from said wing, said means for displacing said flap each including: a lead screw

extending rearwardly from said wing, means for rotating said lead screw, a follower threaded on said lead screw and means so connecting said follower to said flap that rotary motion of said lead screw is converted into
5 rectilinear movement of said follower and the aforesaid displacement of said flap and the track of the flap-supporting mechanism.

17. The combination defined in claim 16
wherein there is an articulated joint between the lead
10 screw and the means by which said lead screw is rotated so that said lead screw can follow the movements of said flap as the angle of said flap is changed.

Fig. 1

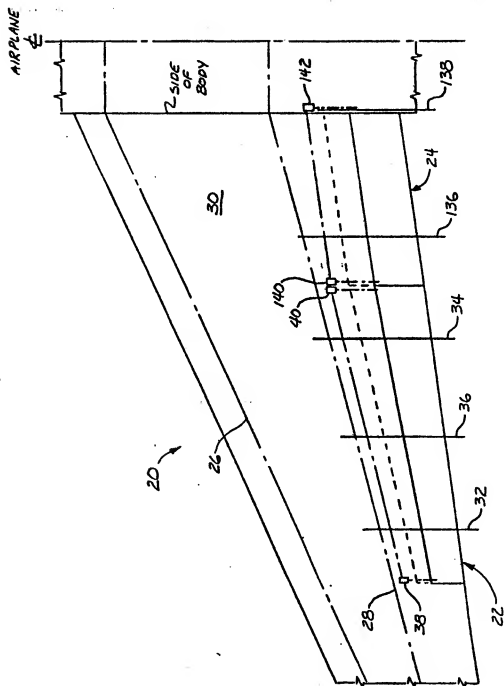
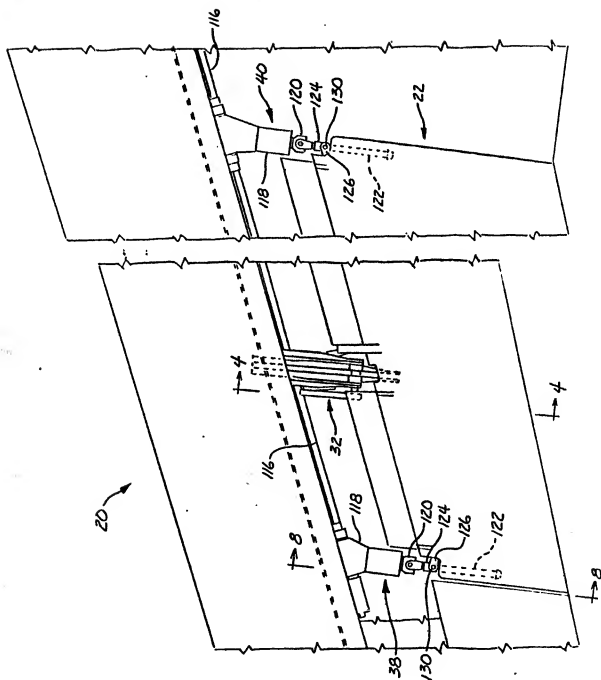


Fig. 2



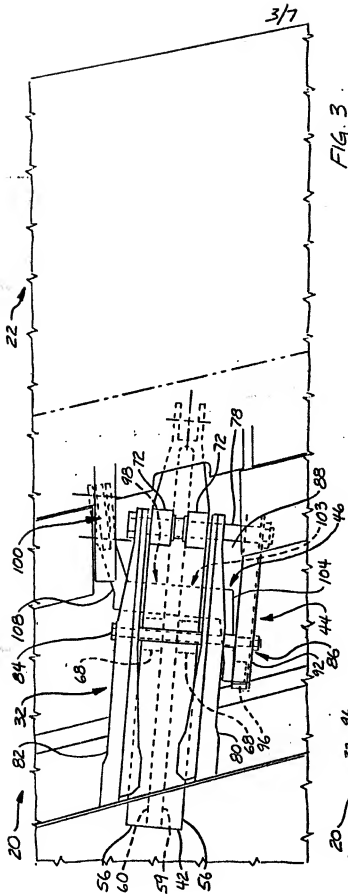
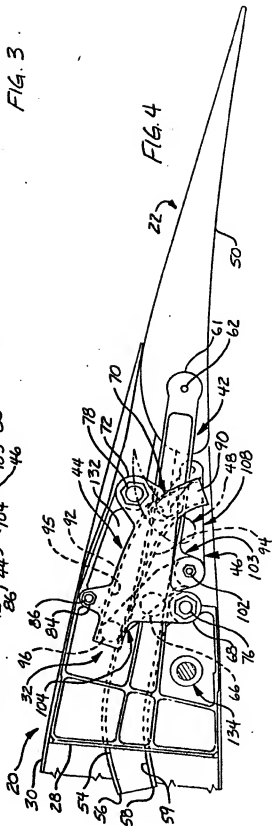
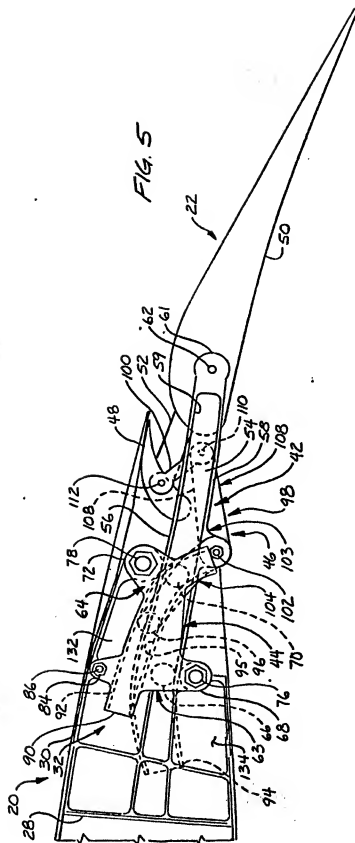
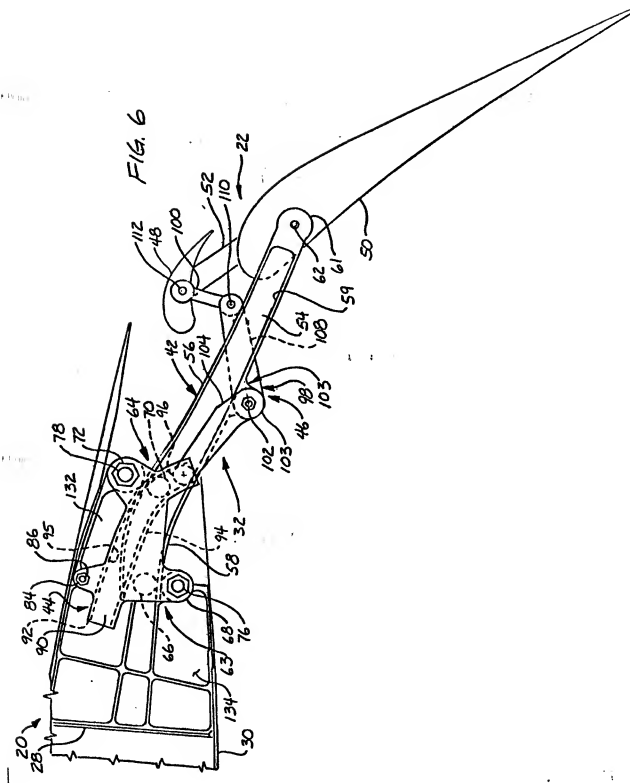


FIG. 3







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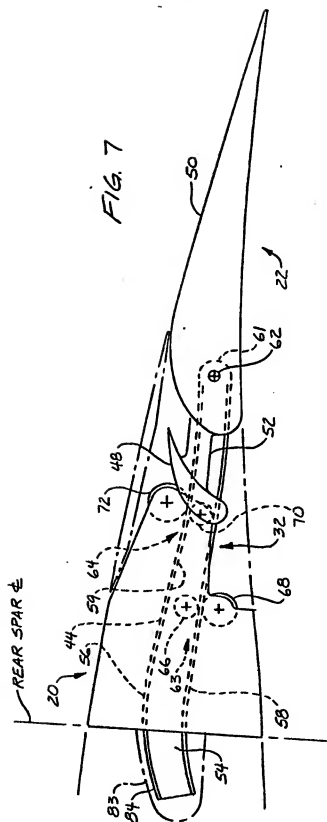
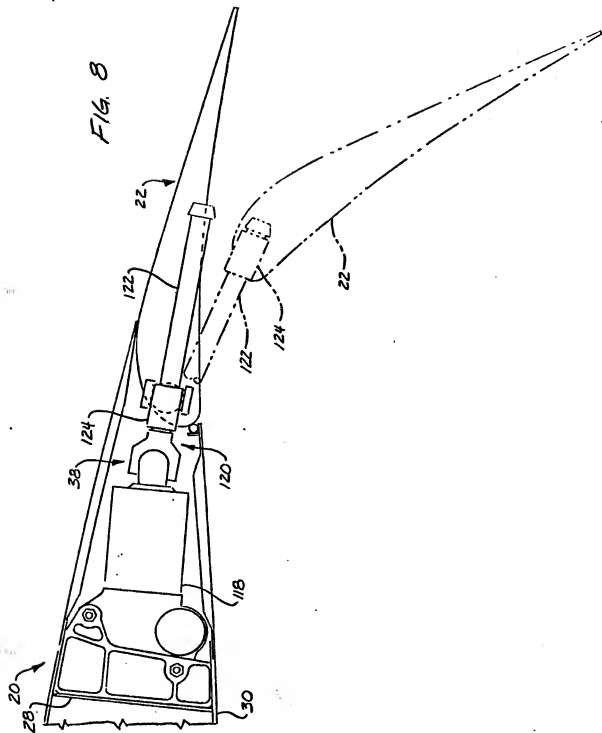


FIG. 8





European Patent
Office

EUROPEAN SEARCH REPORT

0 230 061

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	FR-A-2 115 081 (SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE) * Page 4, lines 1-17 *	1,3,7	B 64 C 9/22
A		9	
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A		1,3-5	
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A		1,3,6, 16,17	B 64 C
A	FR-A- 870 963 (ARADO-FLUGZEUGWERKE GmbH) * Page 1, line 56 - page 2, line 27 *	1,3	
A	US-A-4 448 375 (G.F. HERNDON) * Column 5, lines 15-30 *	2	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10-04-1987	Examiner HAUGLUSTAINE H.P.M.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : technological background O : non-written disclosure P : intermediate document & : member of the same patent family, corresponding document	



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
D, A	US-A-2 202 430 (H. REBESKI) * Whole document *	1, 3	
D, A	US-A-2 426 785 (D.J. NAUMANN) * Whole document *	1, 3	
D, A	US-A-3 438 598 (K.V. TAMMEL) * Whole document *	1, 3	
<p>The present search report has been drawn up for all claims</p>			<p>TECHNICAL FIELDS SEARCHED (Int. Cl. 4)</p>
<p>Place of search THE HAGUE</p>		<p>Date of completion of the search 10-04-1987</p>	<p>Examiner HAUGLUSTAINE H.P.M.</p>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document</p>			